AURORA Railroad Highway Crossing Signals and AURORA EZ Install Gate Arm Lights

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Operation and Maintenance Manual
P2468

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Operation and Maintenance Manual

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PREFACE

NOTICE OF CONFIDENTIAL INFORMATION

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ABOUT THE MANUAL

This manual is intended to provide the necessary information to maintain and ensure proper operation of the AURORA Highway Crossing Signal and the AURORA Gate Arm Light.

The information in this manual is arranged into sections. The title and a brief description of each section follow:

Section 1 - GENERAL DESCRIPTION: This section gives general information on the components of the AURORA Highway Crossing Signal and the AURORA Gate Arm Light. Safety precautions are also provided in this section.

Section 2 - THEORY OF OPERATION: This section gives general information on the operation of the AURORA Highway Crossing Signal and the AURORA Gate Arm Light. Safety precautions are also provided in this section.

Section 3 - INSTALLATION: This section describes the field installation and setup of the AURORA Highway Crossing Signal and the AURORA Gate Arm Light.

Section 4 - PREVENTIVE MAINTENANCE: This section describes the tools, preventive maintenance procedures, and functional tests performed on the AURORA Highway Crossing Signal and the AURORA Gate Arm Light . The frequency and interval, for the performance of the given maintenance procedures, are also included.

Section 5 - TROUBLESHOOTING: This section describes possible failures/symptoms along with the corrective action for the AURORA Highway Crossing Signal and the AURORA Gate Arm Light.

Section 6 - CORRECTIVE MAINTENANCE: This section describes the adjustment and replacement procedures associated with corrective maintenance of the AURORA Highway Crossing Signal and the AURORA Gate Arm Light.

Section 7 - PARTS CATALOG: This section identifies and lists the spare parts associated with operations of the AURORA Highway Crossing Signal and the AURORA Gate Arm Light.

1 MANUAL SPECIAL NOTATIONS

In the ALSTOM manuals, there are four methods used to convey special informational notations to the reader. These notations are warnings, cautions, notes, and disclaimers. Both warnings and cautions are readily noticeable by boldface type and a box around the entire informational statement.

1.1 WARNING

A warning is the most important notation to heed. A warning is used to tell the reader that special attention needs to be paid to the message because if the instructions or advice is not followed when working on the equipment then the result could be either serious harm or death. The sudden, unexpected operation of a switch machine, for example, or the technician contacting the third rail could lead to personal injury or death. An example of a typical warning notice follows:

WARNING

DISCONNECT THE MOTOR ENERGY WHENEVER THE GEAR COVER IS REMOVED. OTHERWISE, THE SWITCH MACHINE MAY OPERATE UNEXPECTEDLY AND POSSIBLY CAUSE PERSONAL INJURY

1.2 CAUTION

A caution statement, the second most important of the four, is used when an operating or maintenance procedure, practice, condition, or statement, which if not strictly adhered to, could result in damage to or destruction of equipment. A caution statement is also used when personnel could be surprised if shocked by a circuit operating at a low current. A typical caution found in a manual is as follows:

CAUTION

TURN POWER OFF BEFORE ATTEMPTING TO REMOVE OR INSERT CIRCUIT BOARDS INTO A MODULE. BOARDS CAN BE DAMAGED IF POWER IS NOT TURNED OFF.

1.3 NOTE

A note is normally used to provide minor additional information to the reader to explain the reason for a given step in a test procedure or to just provide a background detail. An example of the use of a note follows:

Note

A capacitor may be mounted on the circuit board with a RTV adhesive. Use the same color RTV.

1.4 DISCLAIMER STATEMENT

A disclaimer statement, if used, generally tells the reader that the application of the provided information may not be suitable or safe for the particular system. This statement may be found in non-ALSTOM product manuals, that is, manuals from various OEM suppliers. The location of this kind of statement is found at the front of the manual before the first section.

If an ALSTOM manual uses a disclaimer statement, the reader can find such a statement by seeing the following heading centered and in boldface type.

*****DISCLAIMER STATEMENT*****

TABLE OF CONTENTS

SECTION 1 - GENERAL DESCRIPTION

1 SCOPE OF MANUAL 1-1
2 GENERAL 1-1
3 AURORA HIGHWAY CROSSING SIGNAL 1-1
3.1 Housing 1-2
3.2 LED Light Source 1-3
4 AURORA GATE ARM LIGHT 1-4

SECTION 2 - THEORY OF OPERATION

1 GENERAL 2-1
2 AURORA HIGHWAY CROSSING SIGNAL 2-1
3 AURORA GATE ARM LIGHT 2-2

SECTION 3 - INSTALLATION

1 GENERAL 3-1
2 AURORA HIGHWAY CROSSING SIGNAL AND AURORA GATE ARM LIGHT MOUNTING 3-1
2.1 Highway Crossing Signal Installation and Verification 3-2
2.2 Gate Arm Light Installation and Verification 3-7

SECTION 4 - PREVENTIVE MAINTENANCE

1 GENERAL 4-1
2 PREVENTIVE MAINTENANCE 4-2
2.1 AURORA Highway Crossing Signal Preventive Maintenance Procedures 4-3
2.2 AURORA Highway Crossing Signal Functional Check 4-6
2.3 AURORA Gate Arm Light Preventive Maintenance Procedures 4-7
2.4 AURORA Gate Signal Functional Check 4-9

SECTION 5 - TROUBLESHOOTING

1 GENERAL 5-1
2 TROUBLESHOOTING GUIDE 5-1

TABLE OF CONTENTS (CONT.)

SECTION 6 - CORRECTIVE MAINTENANCE

1 GENERAL 6-1
2 CORRECTIVE MAINTENANCE 6-1
3 TOOLS REQUIRED 6-2
4 AURORA HIGHWAY CROSSING SIGNAL CORRECTIVE MAINTENANCE PROCEDURES 6-3
4.1 Signal Head Replacement 6-3
4.2 LED Lamp Unit Replacement 6-3
4.3 Gasket Replacement 6-6
5 AURORA GATE ARM LIGHT CORRECTIVE MAINTENANCE PROCEDURES 6-9
5.1 Gate Arm Light Replacement 6-9

SECTION 7 - PARTS CATALOG

1 GENERAL 7-1
2 ORDERING INFORMATION 7-1
3 PARTS LIST AND DRAWINGS 7-1

LIST OF ILLUSTRATIONS

Figure	Title	Page
1-1	AURORA Highway Crossing Signal Housing	1-2
1-2	AURORA LED Lamp Unit	1-3
1-3	AURORA Gate Arm Light	1-4
5-1	AURORA Highway Crossing Signal Troubleshooting Chart	5-2
5-2	AURORA Gate Arm Light Troubleshooting Chart	5-3
7-1	AURORA LED Lamp Unit Drawing, for P/N 52955-050-00 and 52955-051-00 (Shown)	7-3
7-2	ALSTOM AURORA Signal Housing, P/N 55051-013-00	7-5
7-3	AURORA Gate Arm Light Kit Complete, without Cords, Catalog Number A30-944 (P/N 59649-201-01)	7-9
7-4	AURORA Gate Arm Light EZ Plug-in Kit with Cords, Catalog Number A30-0950 (P/N 59649-201-03)	7-11

LIST OF TABLES

TABLE	TITLE	PAGE
2-1	AURORA Highway Crossing Signal Physical Characteristics	2-1
2-2	AURORA Gate Arm Light Physical Characteristics	2-2
3-1	AURORA Highway Crossing Signal Installation Procedure	3-3
3-2	AURORA Highway Crossing Signal Retrofit Procedure	3-4
3-3	AURORA Highway Crossing Signal Verification Test Procedure	3-6
3-4	AURORA Gate Arm Light Kit A30-0950 Installation Procedure	3-8
3-5	AURORA Gate Arm Light Kit A30-944 Installation Procedure For a Gate Arm With Field Wires Passed Through the Light	3-9
3-6	AURORA Gate Arm Light Kit A30-944 Installation Procedure For a Gate Arm With Field Wires Inside the Gate Arm	3-10
3-7	AURORA Gate Arm Light Verification Test Procedure	3-11
4-1	Preventive Maintenance Procedure Index	4-2
4-2	AURORA Highway Crossing Signal Inspection Procedure	4-3
4-3	AURORA Highway Crossing Signal Lens Cleaning Procedure	4-4
4-4	AURORA Signal Housing Lubrication Procedure	4-5
4-5	AURORA Highway Crossing Signal Functional Check Procedure	4-6
4-6	AURORA Gate Arm Light Inspection Procedure	4-7
4-7	AURORA Gate Arm Light Cleaning Procedure	4-8
4-8	AURORA Gate Arm Light Functional Check Procedure	4-9
5-1	Troubleshooting Flowchart Symbols	5-1
6-1	Corrective Maintenance Procedures	6-1
6-2	General Tools and Equipment	6-2
6-3	AURORA Highway Crossing Signal LED Lamp Unit Replacement Procedure	6-3
6-4	AURORA Highway Crossing Signal LED Lamp Unit Gasket Replacement Procedure	6-6
6-5	AURORA Gate Arm Light Replacement Procedure	6-9
7-1	AURORA 160 LED Lamp Unit Kit, No Housing for a 12 inch Highway Crossing Signal (59649-200-02)	7-7
7-2	AURORA 300 LED Lamp Unit Kit, No Housing for a 12 inch Highway Crossing Signal (59649-200-03)	7-7
7-3	AURORA 160 LED Lamp Unit Kit With Housing for a 12 inch Highway Crossing Signal Layout (59649-200-04)	7-7
7-4	AURORA 300 LED Lamp Unit Kit With Housing for a 12 inch Highway Crossing Signal Layout (59649-200-05)	7-7

LIST OF TABLES (CONT.)

TABLE	TITLE	PAGE
7-5	AURORA Gate Arm Light Kit Complete, without Cords, Catalog Number A30-944 (P/N 59649-201-01)	7-13
7-6	AURORA Gate Arm Light EZ Plug-in Kit with Cords, Catalog Number A30-0950 (P/N 59649-201-03)	7-14

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SECTION 1

GENERAL DESCRIPTION

1 SCOPE OF MANUAL

This manual contains information that explains the operation and maintenance of the ALSTOM AURORA™ Highway Crossing Signal and the ALSTOM AURORA™ Gate Arm Light.

2 GENERAL

This section briefly describes the components and physical characteristics of typical AURORA Highway Crossing Signals and AURORA Gate Arm Lights.

3 AURORA HIGHWAY CROSSING SIGNAL

The AURORA Highway Crossing Signal is a twelve inch signal including a self contained LED light source to show an aspect with the following features:

- The signal is available in both a 160 LED version (850 candela intensity on axis) and a 300 LED version (1600 candela intensity on axis).
- The signal LED lamp unit is a sealed unit that includes a high impact, UV stabilized, outer lens and separate white sidelights.
- The signal lamp unit is available as a complete signal head with an aluminum housing, 20” background, and hood, or as a retrofit kit for installation in any standard highway-crossing signal housing.
- A regulated power supply maintains constant light output over supply voltage variation.

3.1 HOUSING

The AURORA Highway Crossing Signal housing consists of cast metal components. The aluminum housing has a hinged front cover with a rounded back and a hood. An entrance/exit hole for wiring is located at the top of the rounded back, while the hinge is located at the bottom of the unit. A gasket is used between the housing and the LED lamp unit to keep out moisture.

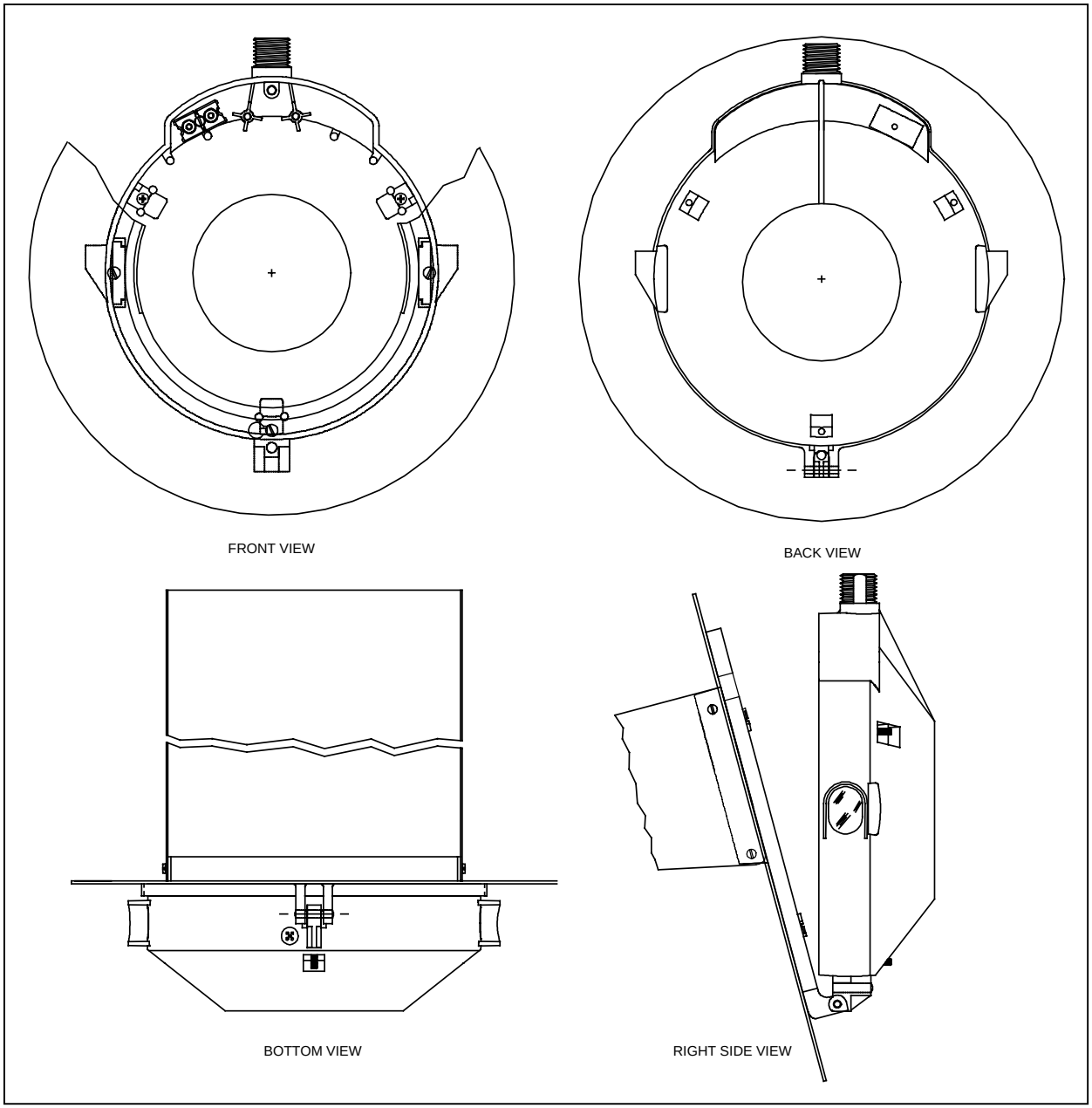


Figure 1-1. AURORA Highway Crossing Signal Housing

3.2 LED LIGHT SOURCE

The AURORA LED light source, or LED lamp unit, measures 12” in diameter. It is a self contained unit; the lens and individual LEDs are not replaceable. Two secured 600V, 150ºC, 16 AWG jacketed, 30-inch long wires with terminal rings compatible with AAR terminal posts (.242” O.D.) are provided for electrical connections. These wires are provided twisted approximately 1 turn per inch.

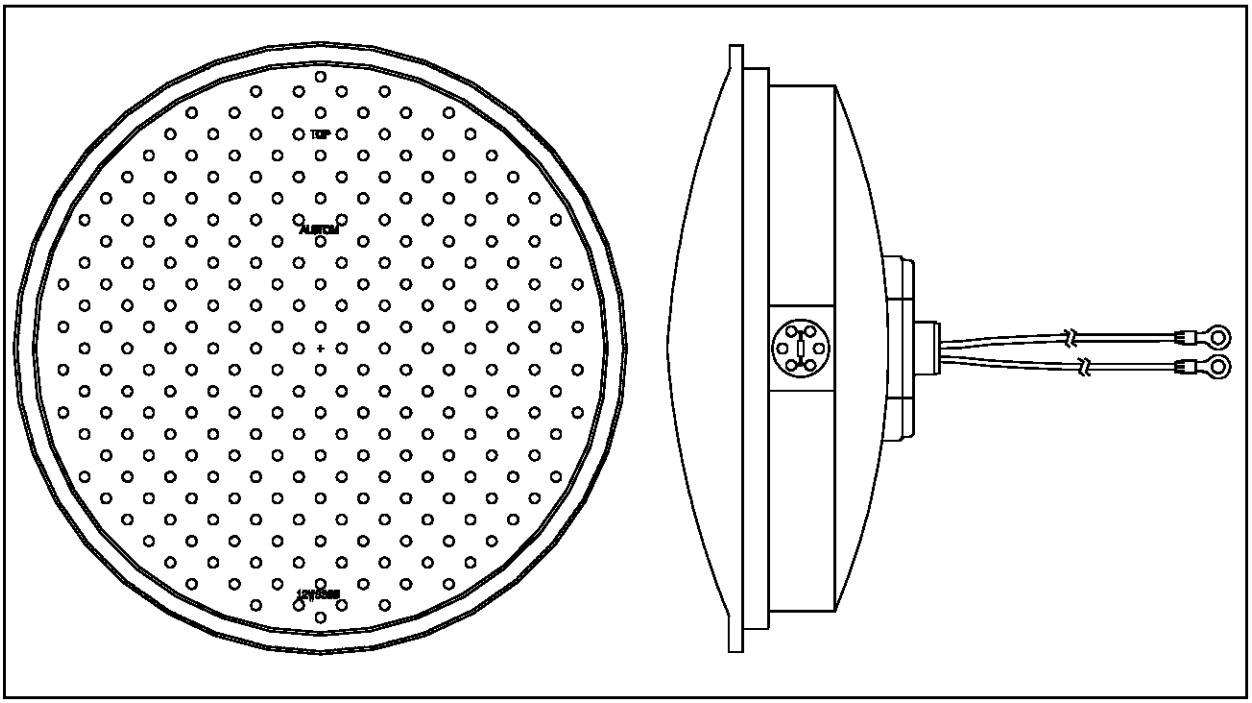


Figure 1-2. AURORA LED Lamp Unit

4 AURORA GATE ARM LIGHT

AURORA Gate Arm Lights are durable, low maintenance, easy to install, and use less than twenty percent of the power required by conventional incandescent gate arm lights. The light is a solid, rugged unit that mounts on top of the gate arm. Each unit has just four wires connected to the gate arm electrical cord. Polycarbonate housing protects two internal LED boards from the weather.

The Gate Arm Light uses red LEDs similar to those in the AURORA Highway Crossing Signal. The LEDs have a rapid on/off time, resulting in a fast and noticeable flash.

This Gate Arm Light can be installed on fiberglass or wooden gate arms that use 0.325 to 0.360 diameter, AWG 18/3 or AWG 16/3, SJOW or SJOW-A medium-duty electrical cords. Gate Arm Lights are also available in a kit with “plug-in” connectors and coil cords for easy assembly.

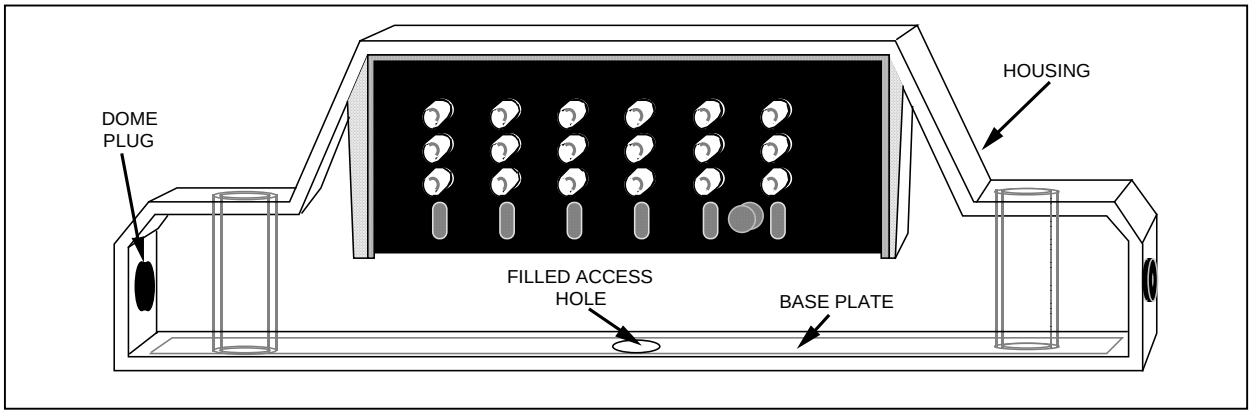


Figure 1-3. AURORA Gate Arm Light

SECTION 2

THEORY OF OPERATION

1 GENERAL

This section contains operating information on the AURORA Highway Crossing Signal and AURORA Gate Arm Light.

2 AURORA HIGHWAY CROSSING SIGNAL

Table 2-1. AURORA Highway Crossing Signal Physical Characteristics

Characteristic	AURORA 160	AURORA 300
Operating Voltage	8 to 20 VDC or 8 to 16 VAC	8 to 20 VDC or 8 to 16 VAC
Current (nominal)	1.0 Amps at 10 VDC 1.1 Amps at 10 VAC	1.2 Amps at 10 VDC 1.3 Amps at 10 VAC
Typical Power Consumption	10 Watts at 10 VDC 11 Watts at 10 VAC	12 Watts at 10 VDC 13 Watts at 10 VAC
Dominant Wavelength	630 NM	630 NM
Peak Intensity	850 candela	1600 candela
Temperature Range Operating Storage	 -40°C to +70°C -55°C to +85°C	 -40°C to +70°C -55°C to +85°C

3 AURORA GATE ARM LIGHT

Table 2-2. AURORA Gate Arm Light Physical Characteristics

Characteristic	AURORA Gate Arm Light
Operating Voltage	8.5 to 12 VDC or 8.5 to 12 VAC
Current (nominal)	0.45 Amps at 10 VDC 0.5 Amps at 10 VAC
Power Rating	4.5 Watts at 10 VDC 5.0 Watts at 10 VAC
Dominant Wave Length	630 NM
Temperature Range Operating Storage	 -40°C to +70°C -55°C to +85°C
Mounting Holes in Housing	5.9" (14.98 cm) apart

SECTION 3

INSTALLATION

1 GENERAL

This section describes the installation of the AURORA Highway Crossing Signal and the AURORA Gate Arm Light, including lamp tests to verify performance upon installation. If a fault is suspected, refer to Section 5 for troubleshooting procedures.

2 AURORA HIGHWAY CROSSING SIGNAL AND AURORA GATE ARM LIGHT MOUNTING

The AURORA Highway Crossing Signal housing includes a standard 1.25-11.5 NPSM male thread located at the top of the case that allows it to easily replace any existing highway crossing signal housing available on the market.

The AURORA Highway Crossing Signal LED lamp unit can be mounted within any existing 12 inch highway crossing signal housing.

The AURORA Gate Arm Light is installed on the crossing gate arm.

Refer to Section 7 for sample parts lists and signal assembly drawings.

2.1 HIGHWAY CROSSING SIGNAL INSTALLATION AND VERIFICATION

The Highway Crossing Signal is available as a complete signal head with an aluminum housing, 20” background, and hood, or as a retrofit kit for installation in any standard highway crossing signal housing.

The procedure in Table 3-1 provides the procedure for installing the AURORA signal housing with LED lamp unit.

Table 3-2 provides the procedure for how to retrofit a 12" (304.8mm) incandescent highway-crossing signal with the AURORA LED lamp unit.

Follow both installation procedures with the lamp verification test provided in Table 3-3 and any alignment procedures required by the local authority or per the AREMA Communication and Signals manual.

CAUTION

DO NOT LOOK DIRECTLY INTO LIT LEDS AT CLOSE RANGE.

Table 3-1. AURORA Highway Crossing Signal Installation Procedure

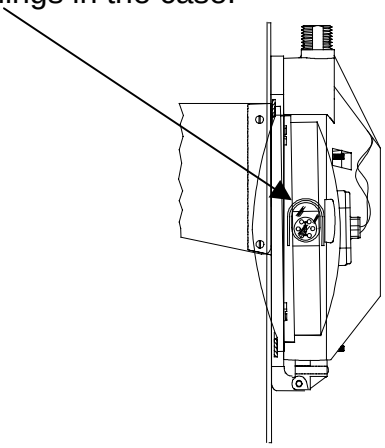
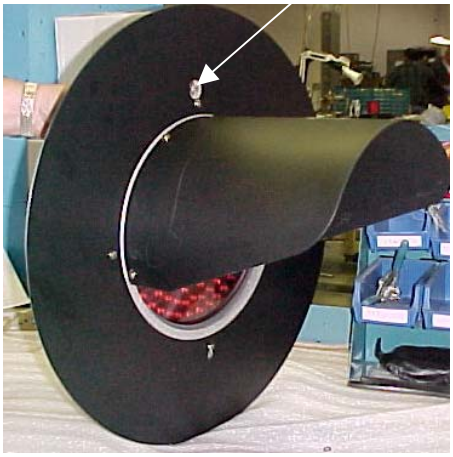
Step	Procedure
1	Install signal post per manufacturer's instructions and location Book of Plans.
2	Use the mounting hardware received with the AURORA Highway Crossing Signal housing to attach the housing to the signal post. Power leads to the signal should be twisted together, approximately 1 turn per inch of wire.
3	Pivot the signal housing front cover closed. Check that the side lights are aligned with the openings in the case. 
4	Fasten the housing closed by tightening the nut located at the top of the housing front cover. 
5	Perform the verification procedure provided in Table 3-3 and any alignment procedures required by the local authority or per the AREMA Communication and Signals manual.

Table 3-2. AURORA Highway Crossing Signal Retrofit Procedure

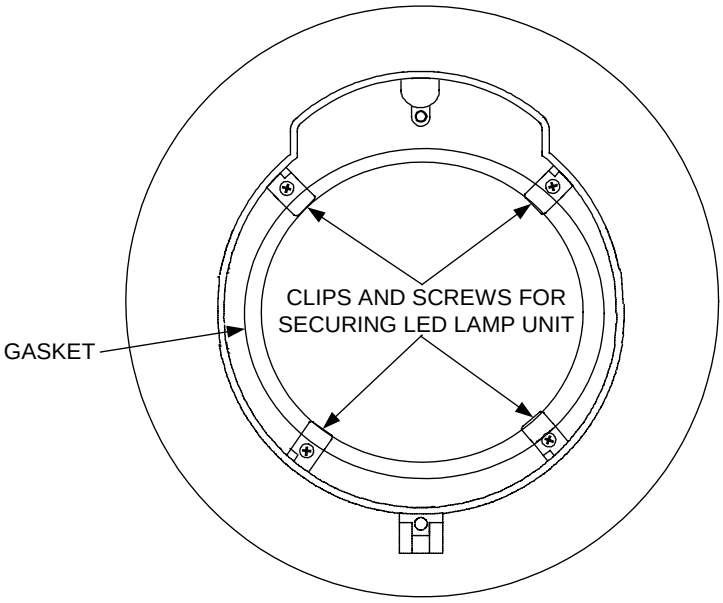
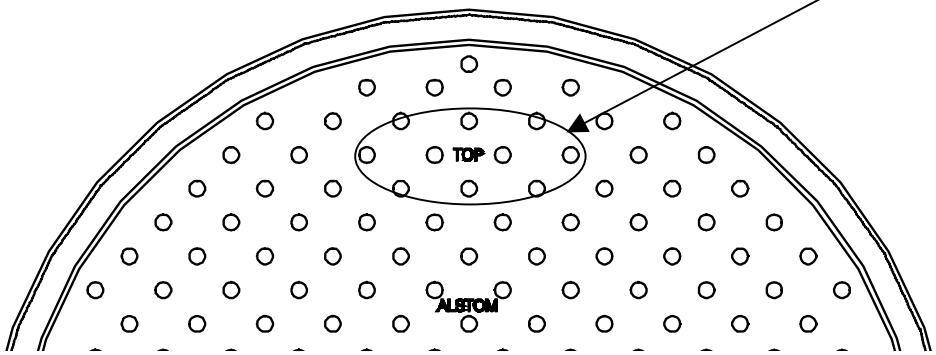
Step	Procedure
1	Remove the existing lamp, lamp bracket, and reflector from the signal head.
2	Center the gasket in front signal housing cover, in the groove located in the center of the cover.  INSIDE FRONT COVER VIEW
3	Center the lamp unit over the gasket in the cover so that the word “top” on the lamp unit board will be at the top when the cover is the closed.  Secure the lamp unit with the screws and clips provided.

Table 3-2. AURORA Highway Crossing Signal Retrofit Procedure (Cont.)

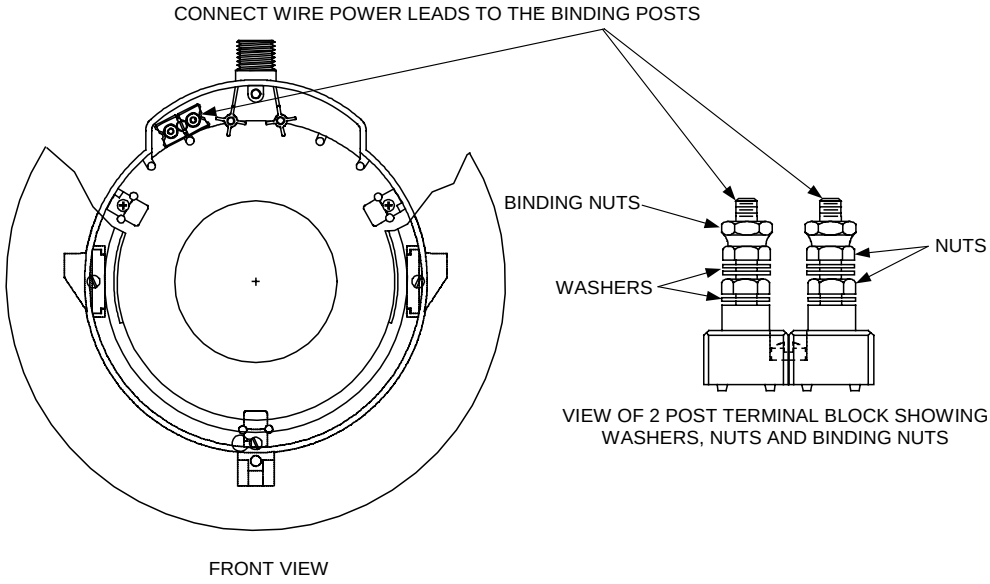
Step	Procedure
4	Connect the twisted wire power leads from the AURORA LED lamp unit to the binding posts inside signal head. The AURORA LED lamp unit is not sensitive to the polarity of the wires, therefore the power leads may be connected without regard to “positive” and “negative” leads.  (This example shows an ALSTOM AURORA Highway Crossing Signal housing.)
5	If signal head has no AAR terminal block, use wire nuts or butt connectors to secure wires from the LED lamp unit to field wires coming into signal head.
6	Close the signal door and fasten the housing closed by tightening the nut provided at the top of the housing front.
7	Perform the verification procedure provided in Table 3-3 and any alignment procedures required by the local authority or per AREMA Communication and Signals manual.

Table 3-3. AURORA Highway Crossing Signal Verification Test Procedure

Step	Procedure
1	Remove power from the Highway Crossing Signal.
2	Check operating voltage to the LED lamp unit and adjust as necessary to maintain target voltage (8 to 20 VDC or 8 to 16 VAC) at signal.
3	Reapply power to the Highway Crossing Signal.
4	Perform the AURORA Highway Crossing Signal Functional Check Procedure provided in Table 4-5.
5	Align signal following procedures for standard incandescent signals.

2.2 GATE ARM LIGHT INSTALLATION AND VERIFICATION

There are two Gate Arm Light Kits available. Each kit can be installed on fiberglass or wooden gate arms.

The first kit, catalog number A30-0950, includes three Gate Arm Lights, one straight cord, and two coil cords with quick “plug-in” type connectors. The housing is provided assembled. Table 3-4 provides the procedure for installing this kit.

The second kit, catalog number A30-0944, includes three Gate Arm Lights (without cords) that may be installed on gate arms with existing 0.325 to 0.360 diameter, AWG 18/3 or AWG 16/3, SJOW or SJOW-A medium-duty electrical cords. The housing is provided in three pieces: one half with LED board, a second half, and a base plate. Table 3-5 provides the procedure for installing this kit on a gate arm with field wires passed through the Gate Arm Lights. Table 3-6 provides the procedure for installing this kit on a gate arm with field wires installed inside the gate arm.

Follow all installation procedures with the verification procedure in Table 3-7 followed by any alignment procedures required by the local authority or per the AREMA Communication and Signals manual.

CAUTION

DO NOT LOOK DIRECTLY INTO LIT LEDS AT CLOSE RANGE.

Table 3-4. AURORA Gate Arm Light Kit A30-0950 Installation Procedure

Step	Procedure
1	Fasten the Gate Arm Lights to the gate arm using the power drill and provided 5/16” hex head screws. The first and second lights will have connectors on both sides, the tip light (last light) will have one connector and one end plug.
2	Trim the straight cord to length and strip the outer jacket of the plain end to expose the individual conductors insulated wires.
3	Strip enough of the individual conductors to attach them to the power supply.
4	With the power on, plug the first plug into the connector of the first light and rotate the plug until the light flashes.
5	Plug the coil cord in between the first and second light and rotate the plug until the second light flashes alternately from the first.
6	Plug the coil cord in between the second and third light and rotate the plug until the third light remains on.
7	Tighten all connectors.
8	Distribute 3/8” cable clamp throughout the gate to secure the cable in place and to serve as strain relief for the plugs. Attach the clamps using the remaining 5/16” hex head TEK screws.
9	Perform the AURORA Gate Arm Light Verification Test Procedure in Table 3-7 and any other verification procedures required by the local authority or per AREMA Communication and Signals manual.

Table 3-5. AURORA Gate Arm Light Kit A30-0944 Installation Procedure For a Gate Arm With Field Wires Passed Through the Light

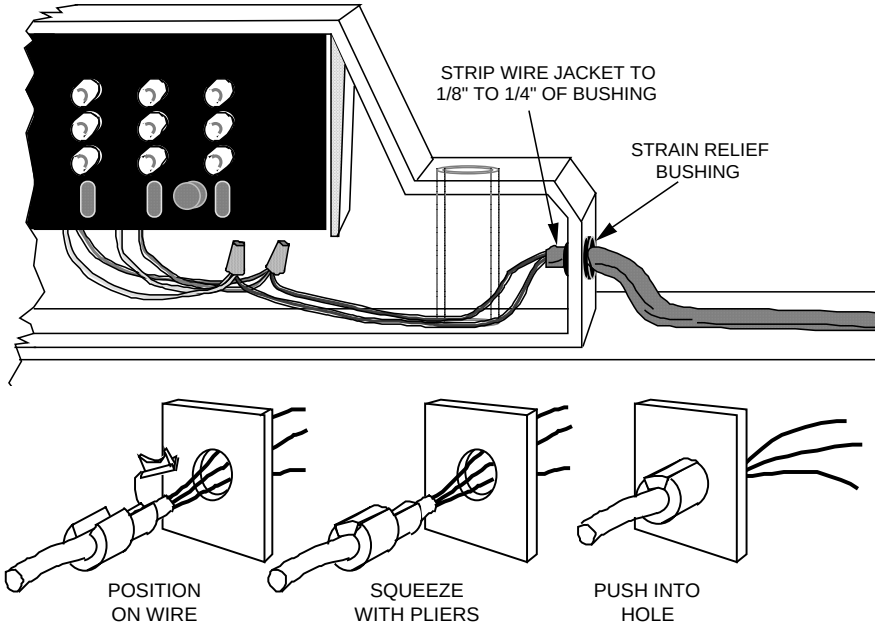
Step	Procedure
1	Strip field wire jacket so that 7" of insulated wire is exposed.
2	Strip insulated wires so that 1/2" of bare wire is exposed.
3	Hold the Gate Arm Light so that the wires attached to the LED boards can be accessed easily. **NOTE** If replacing an existing incandescent unit, then wire each LED board the same as the incandescent unit it replaces.
4	Attach strain relief bushings to field wires as shown. The LED board is not sensitive to the polarity of the wires, therefore the power leads may be connected without regard to “positive” and “negative” leads. 
5	Slide wires into housing and snap strain relief bushings into holes.
6	Snap the 2 halves of the housing together and the base plate onto housing.
7	Fasten Gate Arm Light to the gate arm using self-drilling screws and 5/16" nut driver.
8	Perform the AURORA Gate Arm Light Verification Test Procedure in Table 3-7 and any other verification procedures required by the local authority or per the AREMA Communication and Signals manual.

Table 3-6. AURORA Gate Arm Light Kit A30-0944 Installation Procedure For a Gate Arm With Field Wires Inside the Gate Arm

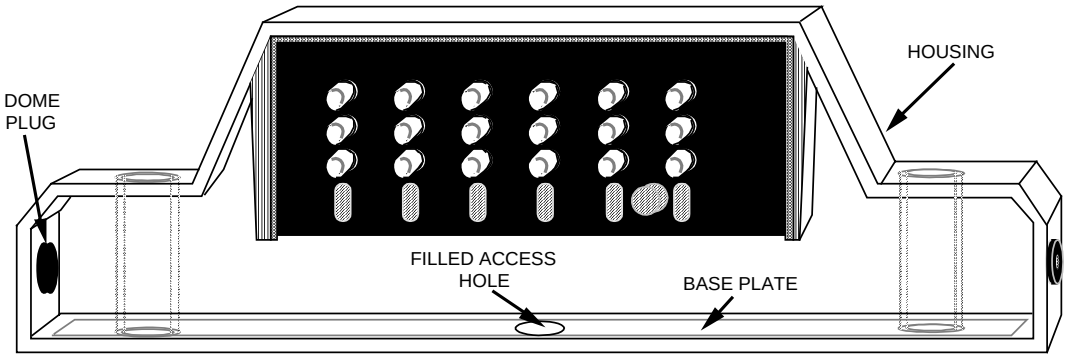
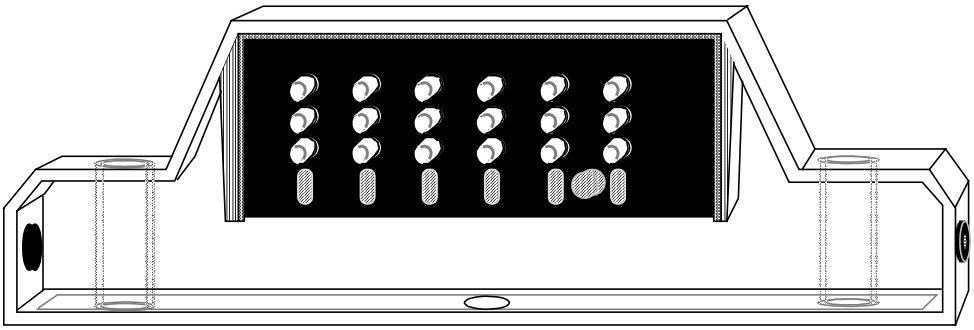
Step	Procedure
1	Strip field wire jacket so that 7" of insulated wire is exposed.
2	Strip insulated wires so that 1/2" of bare wire is exposed.
3	Using a screwdriver, punch out the filled access hole in the base plate of the AURORA Gate Arm Light. 
4	Hold the Gate Arm Light so that the wires attached to the LED boards can be accessed easily. Slide the wires through the hole in the base plate. The LED board is not sensitive to the polarity of the wires, therefore the power leads may be connected without regard to “positive” and “negative” leads. **NOTE** If replacing an existing incandescent unit, then wire each LED board the same as the incandescent unit it replaces.
5	Snap the 2 halves of the housing together and the base plate onto housing.
6	Snap plastic dome plugs into holes on sides of housing.
7	Fasten Gate Arm Light to the gate arm using self-drilling screws and 5/16" nut driver.
8	Perform the AURORA Gate Arm Light Verification Test Procedure in Table 3-7 and any other verification procedures required by the local authority or per the AREMA Communication and Signals manual.

Table 3-7. AURORA Gate Arm Light Verification Test Procedure

Step	Procedure
1	Apply power to the AURORA Gate Arm Light circuit (target voltage of 8.5 to 12 VDC or 8.5 to 12 VAC).
2	Verify all LEDs on both sides of the light illuminate. 
3	Perform the AURORA Gate Arm Light Functional Check Procedure provided in Table 4-8.

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SECTION 4

PREVENTIVE MAINTENANCE

1 GENERAL

This section describes preventive maintenance and testing for the AURORA Highway Crossing Signal and the AURORA Gate Arm Light. If a fault is suspected as a result of this maintenance, the maintainer should refer to Section 5 for the proper signal troubleshooting procedure.

Preventive maintenance helps keep equipment in optimum running condition by allowing maintenance personnel to detect and correct potential problems. Preventive maintenance procedures include inspection, cleaning, and preventive maintenance (PM) checks. PM checks are performed to ensure proper equipment operation based on specific tolerances. These checks identify and isolate possible malfunctions. Troubleshooting information is provided in Section 5.

Corrective maintenance at the field service level is intended to restore malfunctioning equipment to its normal operating condition as quickly as possible. Corrective maintenance procedures including component replacement and voltage adjustments are provided in Section 6.

2 PREVENTIVE MAINTENANCE

Table 4-1 lists the typical preventive maintenance procedures for the AURORA Highway Crossing Signal and the AURORA Gate Arm Light. The Interval column gives the recommended frequency of procedures. The Maintenance Action column lists the preventive maintenance procedure to be performed at the prescribed interval. The Reference column lists the section or table number containing the procedure.

Table 4-1. Preventive Maintenance Procedure Index

Interval	Maintenance Action	Highway Crossing Signal Procedure	Gate Arm Light Procedure
Monthly	Periodic Inspection	Table 4-2	Table 4-6
Monthly or As Needed	External Component(s) Cleaning Procedure	Table 4-3	Table 4-7
Quarterly	Signal Housing Door Hinge and Lock Lubrication	Table 4-4	None
Monthly	Signal Functional Test	Table 4-5	Table 4-8

WARNING

ABIDE BY ALL OPERATIONAL AND SAFETY RULES WHEN ENTERING AND WORKING IN THE RIGHT OF WAY.

2.1 AURORA HIGHWAY CROSSING SIGNAL PREVENTIVE MAINTENANCE PROCEDURES

2.1.1 Inspection Procedure

The inspection procedure for AURORA Highway Crossing Signal should be performed monthly. It may be also be performed any time personnel are in close proximity to the signal. Follow the inspection procedures as outlined in Table 4-2, in the order given. If required, take the corrective actions described to be sure the signal operates properly.

NOTE

The Highway Crossing Signal LED lamp unit is a sealed unit, the LEDs are not replaceable. Replace the whole lamp unit if it fails.

Table 4-2. AURORA Highway Crossing Signal Inspection Procedure

Step	Procedure	Action Taken
1	Inspect housing for scratches, large dents, cracks, warped doors, or other obvious physical damage.	Replace any excessively damaged parts.
2	Check for loose hardware or loose connections.	Tighten.
3	Inspect exterior of signal housing for excessive dirt, dust, or foreign objects.	Remove any foreign objects. Clean case with damp lint-free cloth.
4	Verify that the lens is clean.	If a lens requires cleaning, perform procedure in Table 4-3.
5	Inspect each lens for a cracked or broken lens.	If the lens is cracked or damaged, replace the LED Lamp Unit, perform procedure in Table 6-3.
6	Inspect the housing vent screen for air blockage.	Clean the screen with a brush to remove any dust or debris.
7	Inspect the signal wiring connections, including grounding connections.	Tighten any loose connections.
8	Inspect wiring and cables for broken or brittle wires or cracked insulation.	Replace wire/cable. Wires on the lamp unit are not replaceable, the unit must be replaced if wires are damaged.
9	Inspect the gasket condition for cracks or tears.	Replace the gasket as needed.

Table 4-2. AURORA Highway Crossing Signal Inspection Procedure (Cont.)

Step	Procedure	Action Taken
10	Verify each LED unit illuminates when controlled to be turned on. If more than 26% of the front LEDs do not illuminate (more than 42 for the 160 LED lamp unit and more than 78 for the 300 LED lamp unit) OR if either set of side light LEDs does not illuminate.	Refer to troubleshooting Figure 5-1. Refer to Table 4-5 for the Signal Functional Check Procedure. Replace the LED lamp unit, following the procedure in Table 6-3
11	Inspect hinges and lock for ease of movement/operation.	Lubricate as required, following the Lubrication Procedure in Table 4-4.

2.1.2 Lens Cleaning Procedure

CAUTION

NEVER USE AN ABRASIVE TO CLEAN A LENS.

DO NOT USE A DRY CHAMOIS ON A DRY LENS; THIS PREVENTS ACCIDENTAL SCRATCHING OF THE LENS. DO NOT USE A CLEANER WITH AMMONIA; THIS TYPE OF CLEANER WILL ATTACK THE LENS MATERIAL.

Table 4-3. AURORA Highway Crossing Signal Lens Cleaning Procedure

Step	Procedure
1	Clean the outer protective lens of the signal housing with a soft cloth and a two-percent solution of dishwashing detergent. A plastic cleaner/polish recommended for Polycarbonate can also be used.
2	Rinse and immediately dry with a clean soft cloth.

2.1.3 Lubrication

Hinges on doors, locking eyebolt, and padlocks are lubricated with lightweight oil.

Table 4-4. AURORA Signal Housing Lubrication Procedure

Step	Procedure
1	Sparingly oil door hinges, locking eyebolt, and any padlocks used.
2	Wipe off excess oil.

2.2 AURORA HIGHWAY CROSSING SIGNAL FUNCTIONAL CHECK

The AURORA Highway Crossing Signal Functional Check Procedure, provided in Table 4-5 should be performed monthly unless this frequency is overridden by the governing authority or by those set forth by American Railway Engineering And Maintenance of Way Association (AREMA), Communications & Signals Manual of Recommended Practice. The procedure requires that maintenance personnel observe the operation of the signal while in service or by simulating a train on approach.

This operational test verifies the visibility of the signal. This operational test should be performed when:

- a signal malfunction is suspected
- the signal or one of its components has been repaired
- the signal or one of its components has been replaced

If an indication is not met, proceed to Troubleshooting, Section 5.

CAUTION

DO NOT LOOK DIRECTLY INTO LIT LEDS AT CLOSE RANGE.

NOTE

The AURORA Highway Crossing Signal LED Lamp Unit is a sealed unit, the LEDs are not replaceable. Replace the whole lamp unit if it fails.

Table 4-5. AURORA Highway Crossing Signal Functional Check Procedure

Step	Procedure
1	Observe the AURORA Highway Crossing Signal(s) begin to flash prior to the gate starting to lower when a train is on approach. If it does not flash, then troubleshoot the wiring using the Book of Plans.
2	For each signal, ensure the front LEDs and side light LEDs are illuminating and flashing brightly.
3	Crossing Signals should alternately flash (i.e., in the pair, one is on while the other is off; they then switch with the first off and the second on).
4	If the lights do not operate as described above, follow the Troubleshooting diagram in Section 5.

2.3 AURORA GATE ARM LIGHT PREVENTIVE MAINTENANCE PROCEDURES

2.3.1 Inspection Procedure

The Inspection Procedure for the Gate Arm Light is performed monthly, though it may be performed any time personnel are in close proximity to the signal. Follow the inspection procedures as outlined in Table 4-6, in the order given. If required, take the corrective actions described to be sure the signal operates properly.

Table 4-6. AURORA Gate Arm Light Inspection Procedure

Step	Procedure	Action Taken
1	Inspect Gate Arm Light housing for scratches, large dents, cracks, or other obvious physical damage.	Replace, as necessary.
2	At the gate arm check for loose hardware or loose connections.	Tighten.
3	Inspect exterior of signal housing for excessive dirt, dust, or foreign objects.	Remove any foreign objects, perform the cleaning procedure in Table 4-7.
4	In the junction box, inspect the wiring and cables for brittle or broken wires or cracked insulation.	Tighten any loose connections and replace the wiring or cabling as needed.
5	Verify that each LED unit illuminates when energized.	Refer to troubleshooting Figure 5-1.

2.3.2 Cleaning Procedure

The cleaning procedure provided in Table 4-7 , is performed whenever the exterior of signal housing has excessive dirt, dust, or foreign objects.

Table 4-7. AURORA Gate Arm Light Cleaning Procedure

Step	Procedure
1	Clean the clear Gate Arm Light housing with a soft cloth and a two-percent solution of dishwashing detergent.
2	Rinse and immediately dry with a clean soft cloth.

2.4 AURORA GATE ARM LIGHT FUNCTIONAL CHECK

The AURORA Gate Arm Light Functional Check Procedure, provided in Table 4-8 should be performed monthly unless this frequency is overridden by the governing authority or by those set forth by American Railway Engineering And Maintenance of Way Association (AREMA), Communications & Signals Manual of Recommended Practice. The procedure requires the maintenance personnel to observe the operation of the Gate Arm Lights on the crossing gate arm while in service or by simulating a train on approach.

This operational test verifies the visibility of the Gate Arm Lights. This operational test should be performed when:

- a Gate Arm Light malfunction is suspected
- the Gate Arm Light or one of its components has been repaired
- the Gate Arm Light or one of its components has been replaced

If an indication is not met, proceed to Troubleshooting, Section 5.

CAUTION

DO NOT LOOK DIRECTLY INTO LIT LEDS AT CLOSE RANGE.

Table 4-8. AURORA Gate Arm Light Functional Check Procedure

Step	Procedure
1	Observe the Gate Arm Lights begin to flash prior to the gate starting to lower when a train is on approach. If they do not, then troubleshoot using the Book of Plans.
2	Ensure all Gate Arm Lights are illuminating and flashing as follows: The first two should flash alternately, one is on while the other is off, while the end (tip) light remains on. If the lights do not respond as described above, follow the Troubleshooting diagram in Section 5.

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SECTION 5

TROUBLESHOOTING

1 GENERAL

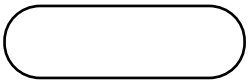
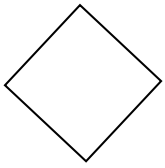
This Section provides troubleshooting instructions on how to sequentially do a series of checks or tests, resulting in a practical repair solution. It is important to follow the instructions in the sequence given.

Troubleshooting flowchart symbols are explained in Table 5-1.

2 TROUBLESHOOTING GUIDE

Troubleshooting information is provided in the form of a fault isolation flowchart provided in Figure 5-1. The flowchart begins with the malfunction symptoms and, based on observations and tests by the maintainer, branches out to isolate probable causes of the malfunction and recommended corrective actions. Troubleshooting flowchart symbols are identified in Table 5-1.

Table 5-1. Troubleshooting Flowchart Symbols

Symbol	Explanation
	Malfunction statement as derived from operator.
	Basic instruction for preparation of a test, procedure or observation. The action taken results in a diagnostic decision.
	Result from previous action that is answered yes or no. If result is within tolerance, answer yes. If not, answer no. Do not consider any gray areas between yes or no.
	Final step of instructions involving corrective measures. Reference publication indicates suspected problem area.

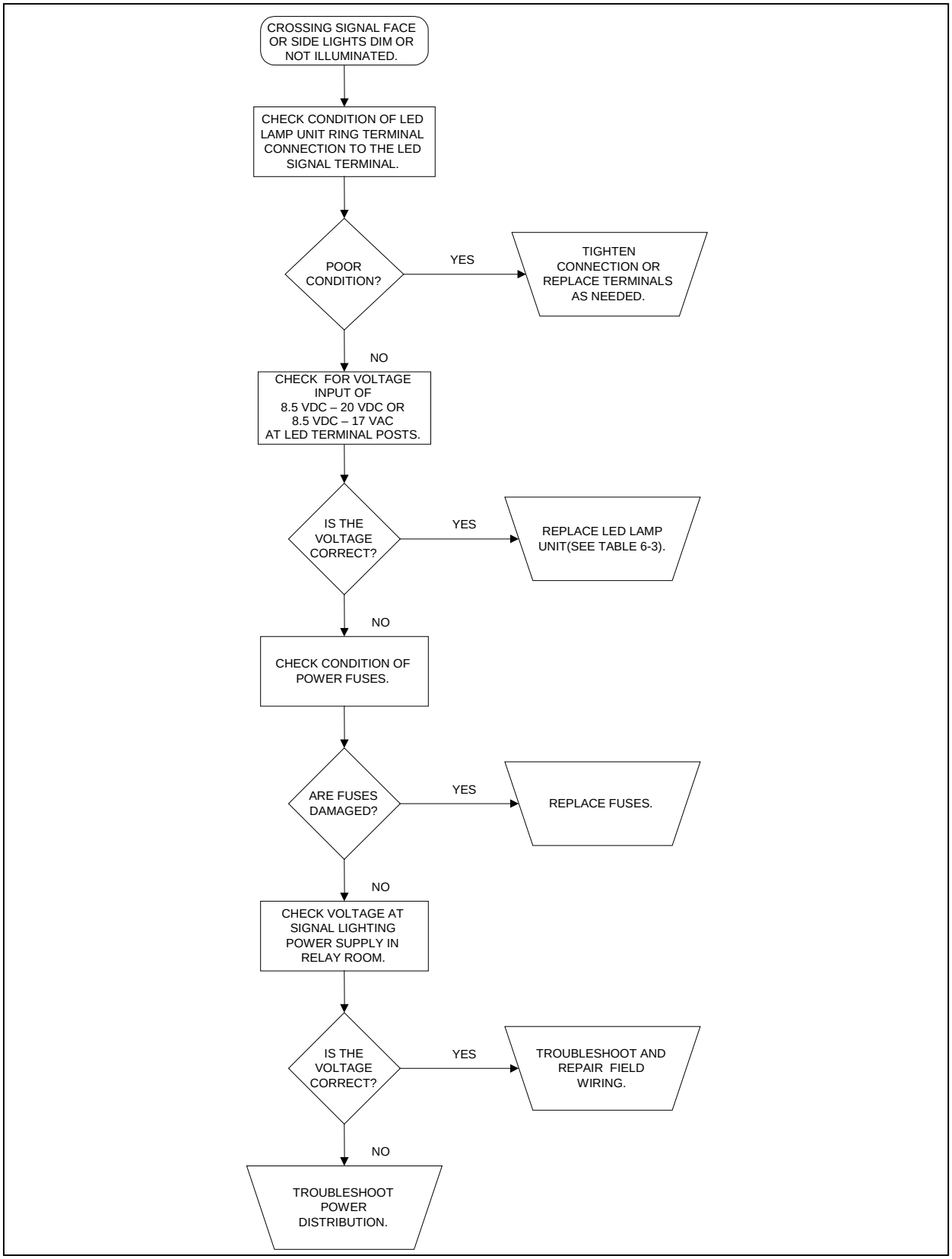

CROSSING SIGNAL FACE OR SIDE LIGHTS DIM OR NOT ILLUMINATED.
CHECK CONDITION OF LED LAMP UNIT RING TERMINAL CONNECTION TO THE LED SIGNAL TERMINAL.
POOR CONDITION?
YES
TIGHTEN CONNECTION OR REPLACE TERMINALS AS NEEDED.
NO
CHECK FOR VOLTAGE INPUT OF 8.5 VDC – 20 VDC OR 8.5 VDC – 17 VAC AT LED TERMINAL POSTS.
IS THE VOLTAGE CORRECT?
YES
REPLACE LED LAMP UNIT(SEE TABLE 6-3).
NO
CHECK CONDITION OF POWER FUSES.
ARE FUSES DAMAGED?
YES
REPLACE FUSES.
NO
CHECK VOLTAGE AT SIGNAL LIGHTING POWER SUPPLY IN RELAY ROOM.
IS THE VOLTAGE CORRECT?
YES
TROUBLESHOOT AND REPAIR FIELD WIRING.
NO
TROUBLESHOOT POWER DISTRIBUTION.

Figure 5-1. AURORA Highway Crossing Signal Troubleshooting Chart

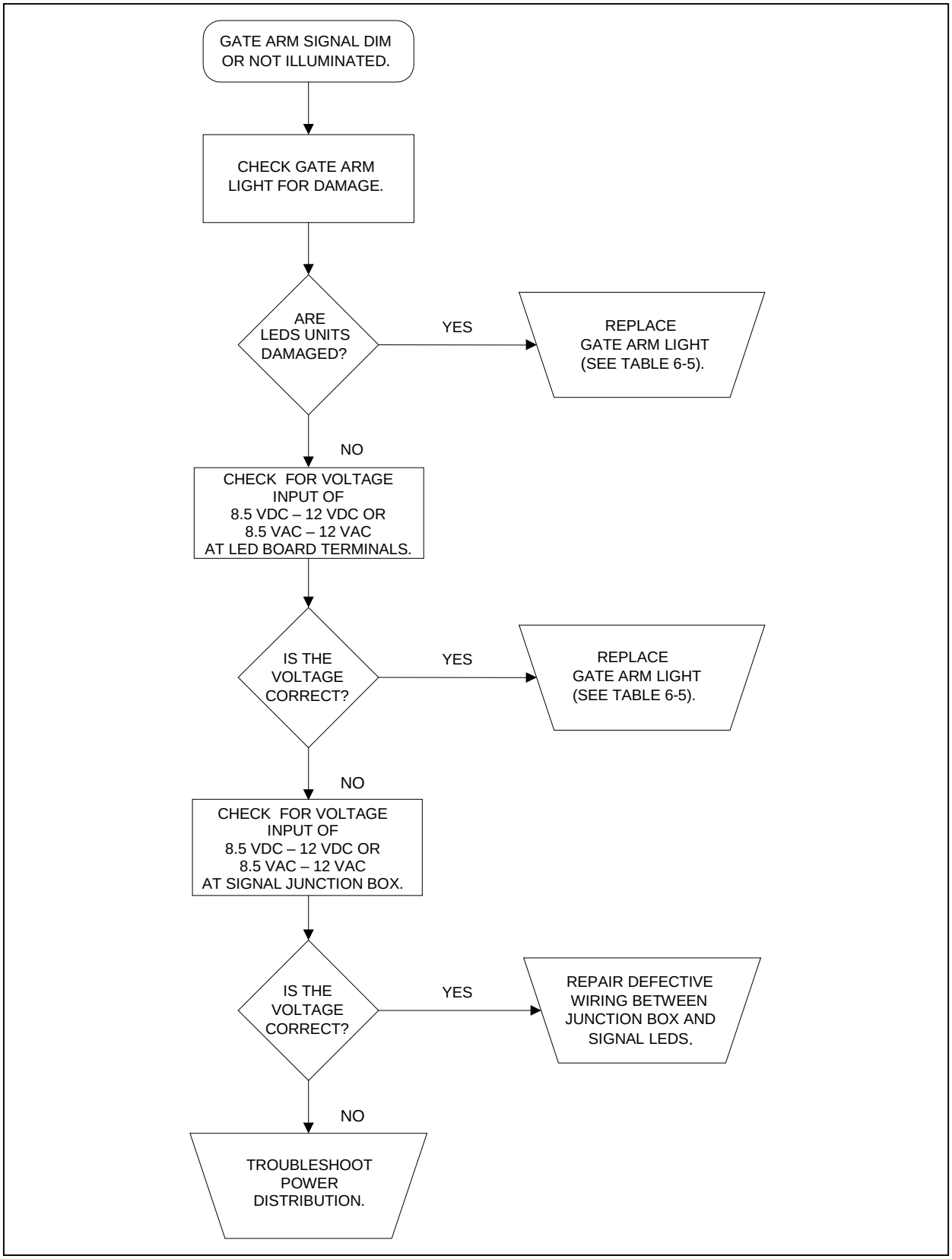

GATE ARM SIGNAL DIM OR NOT ILLUMINATED.
CHECK GATE ARM LIGHT FOR DAMAGE.
ARE LEDS UNITS DAMAGED?
YES
REPLACE GATE ARM LIGHT (SEE TABLE 6-5).
NO
CHECK FOR VOLTAGE INPUT OF 8.5 VDC – 12 VDC OR 8.5 VAC – 12 VAC AT LED BOARD TERMINALS.
IS THE VOLTAGE CORRECT?
YES
REPLACE GATE ARM LIGHT (SEE TABLE 6-5).
NO
CHECK FOR VOLTAGE INPUT OF 8.5 VDC – 12 VDC OR 8.5 VAC – 12 VAC AT SIGNAL JUNCTION BOX.
IS THE VOLTAGE CORRECT?
YES
REPAIR DEFECTIVE WIRING BETWEEN JUNCTION BOX AND SIGNAL LEDS.
NO
TROUBLESHOOT POWER DISTRIBUTION.

Figure 5-2. AURORA Gate Arm Light Troubleshooting Chart

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SECTION 6

CORRECTIVE MAINTENANCE

1 GENERAL

This section outlines corrective maintenance for the AURORA Highway Crossing Signal and the AURORA Gate Arm Light.

2 CORRECTIVE MAINTENANCE

Corrective maintenance, at the field level, is intended to restore proper operation to malfunctioning equipment by replacing components found to be faulty through the troubleshooting procedures in Section 5 or the preventive maintenance procedures in Section 4.

This section contains procedures for replacing the LED Lamp Units in AURORA signals. Use the illustrations referenced in the procedures and associated illustrations shown in Section 7 as a reference for the replacement procedures given in this section.

Table 6-1. Corrective Maintenance Procedures

Interval	Maintenance Action	Reference
As Needed or every 100,000 operating hours	LED Lamp Unit Replacement	Table 6-3
As Needed	LED Lamp Unit Gasket Replacement	Table 6-4
As Needed or every 100,000 operating hours	Gate Arm Light Replacement	Table 6-5

WARNING

VERIFY THAT POWER IS REMOVED FROM THE SIGNAL UNIT PRIOR TO PERFORMING ANY CORRECTIVE MAINTENANCE PROCEDURE.

WARNING

ABIDE BY ALL OPERATIONAL AND SAFETY RULES WHEN ENTERING AND WORKING IN THE RIGHT OF WAY.

CAUTION

DO NOT LOOK DIRECTLY INTO LIT LEDS AT CLOSE RANGE.

3 TOOLS REQUIRED

Table 6-2. General Tools and Equipment

Tools and Equipment	Manufacture/Part Number
Slotted head screwdriver	Commercially available
Phillips head screwdriver	Commercially available
AAR Wrench	ALSTOM P/N 15194-010-02
Wire strippers	Commercially available
5/16” nut driver	Commercially available

4 AURORA HIGHWAY CROSSING SIGNAL CORRECTIVE MAINTENANCE PROCEDURES

4.1 SIGNAL HEAD REPLACEMENT

To replace an AURORA Highway Crossing Signal Head, remove the existing signal head and follow the procedure in Table 3-1. To install another manufacturer's signal head, follow the manufacturer's instructions and perform the retrofit procedure provided in Table 3-2.

4.2 LED LAMP UNIT REPLACEMENT

LED lamp units are expected to operate for approximately 100,000 hours and should be replaced before the end of their life expectancy. Replace LED lamp units on a schedule determined by the local authorities based on this information. Use the procedure provided in Table 6-3 to replace the LED lamp unit.

In addition, LED lamp units should be replaced if any of the following conditions occur:

- When more than 26% of the front LEDs do not illuminate (more than 42 for the 160 LED lamp unit and more than 78 for the 300 LED lamp unit), or when the LEDs in either side light do not illuminate.
- When a preventive or corrective maintenance procedure determines the lamp unit needs to be replaced.
- When a troubleshooting procedure determines the lamp unit needs to be replaced.

Table 6-3. AURORA Highway Crossing Signal LED Lamp Unit Replacement Procedure

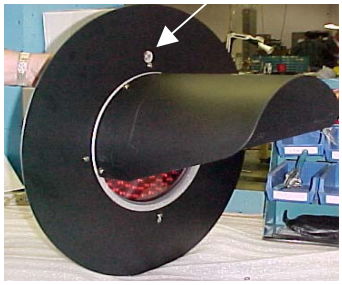
Step	Procedure
1	Remove power to the signal by removing its power feed fuses. (Refer to circuit drawings for location of power feed fuses.)
2	Open the signal by unscrewing the bolt located towards the top of the cover and pivoting the cover down.  Be aware of the gasket located between the LED Lamp Unit and the cover.

Table 6-3. AURORA Highway Crossing Signal LED Lamp Unit Replacement Procedure (Cont.)

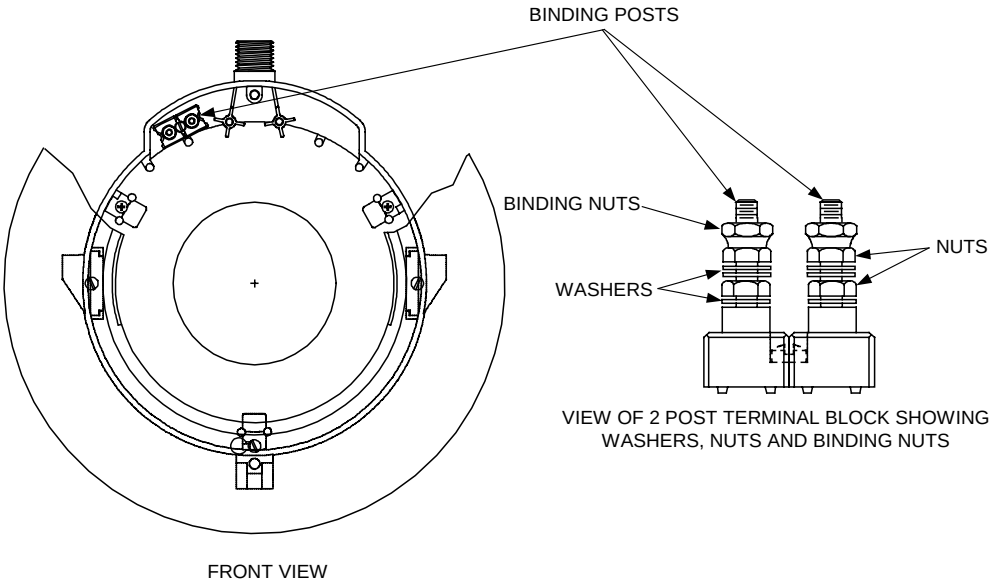
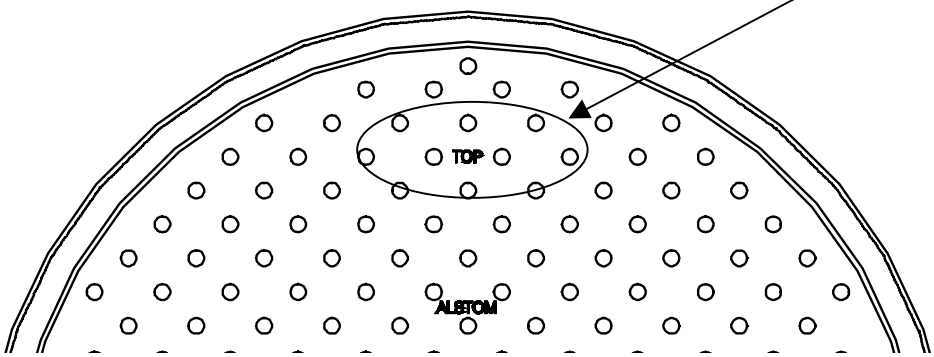
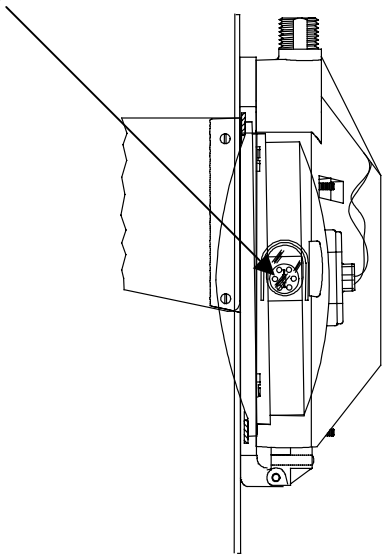
Step	Procedure
3	Disconnect the LED lamp unit ring terminals from the LED Signal Terminal Posts. Loosen the clips and screws securing the lamp unit and remove the existing lamp unit. 
4	Center the lamp unit gasket on the front cover.
5	Center the new lamp unit over the gasket in the cover so that the word “top” on the lamp unit board will be at the top when the cover is closed.  Secure the lamp unit with the screws and clips provided.
6	Connect LED lamp unit ring terminals to the LED Signal Terminal Posts.

Table 6-3. AURORA Highway Crossing Signal LED Lamp Unit Replacement Procedure (Cont.)

Step	Procedure
7	Pivot the signal housing front cover closed. Check that the side lights are aligned with the openings in the case. 
8	Screw down the housing cover nut located towards the top of the cover.
9	Reapply power to the signal.
10	Perform the verification procedure provided in Table 3-3 and any alignment procedures required by the local authority or per AREMA Communication and Signals manual.

4.3 GASKET REPLACEMENT

Replace the Highway Crossing Signal Led lamp unit gasket using the procedure provided in Table 6-4 whenever the gasket is identified as damaged during a preventive or corrective maintenance procedure or during troubleshooting.

Table 6-4. AURORA Highway Crossing Signal LED Lamp Unit Gasket Replacement Procedure

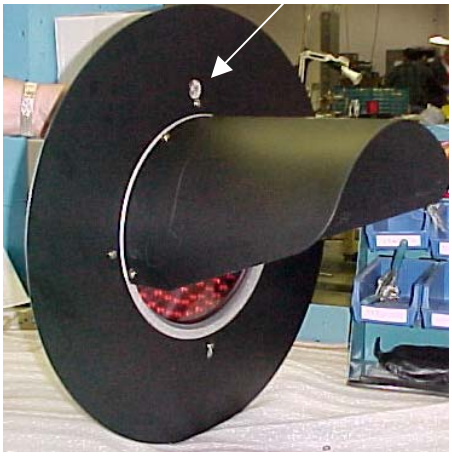
Step	Procedure
1	Remove power to the signal by removing its power feed fuses. **NOTE** Refer to circuit drawings for location of power feed fuses.
2	Open signal by unscrewing the bolt located towards the top of the cover and pivoting the cover down.  Be aware of the gasket located between the LED Lamp Unit and the cover.
3	Loosen the screws securing the clips holding the LED lamp unit onto the front cover. Lift the LED Lamp Unit and remove the gasket located between the LED Lamp Unit and the cover.

Table 6-4. AURORA Highway Crossing Signal LED Lamp Unit Gasket Replacement Procedure (Cont.)

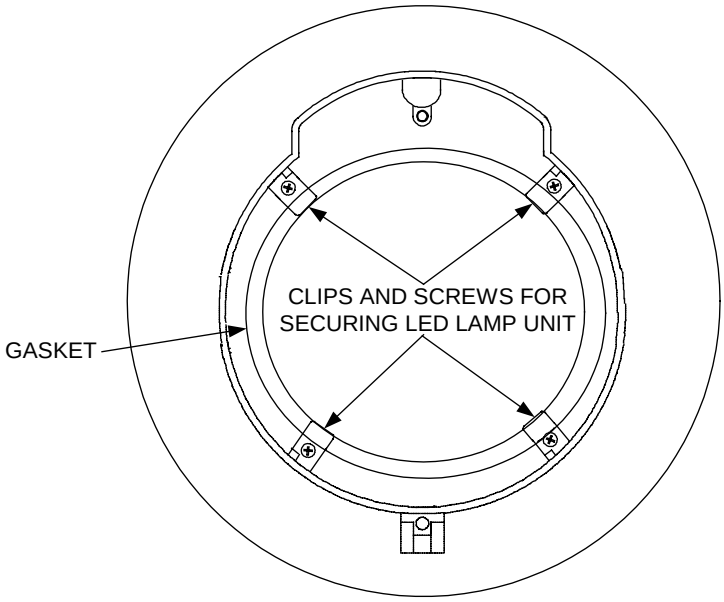
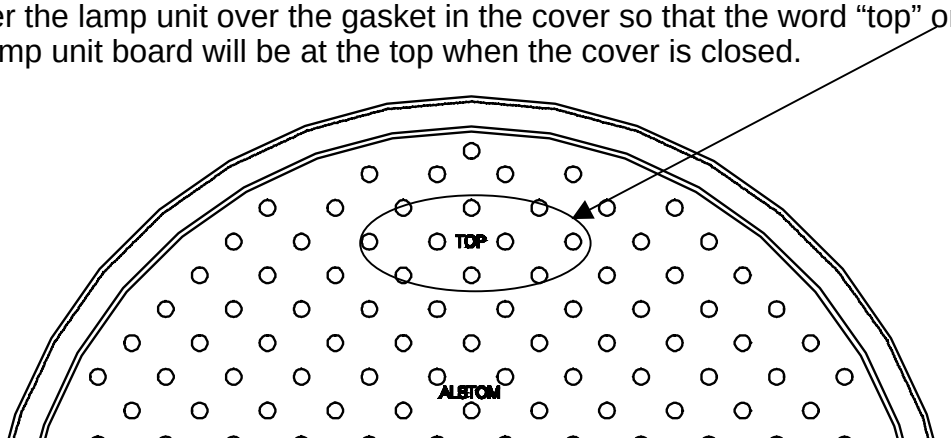
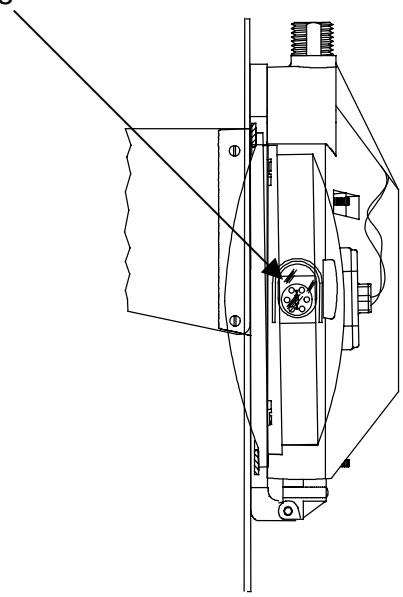
Step	Procedure
4	Center the new gasket on front signal housing cover, in the groove located in the center of the cover.  INSIDE FRONT COVER VIEW
5	Center the lamp unit over the gasket in the cover so that the word “top” on the lamp unit board will be at the top when the cover is closed.  Secure the lamp unit with the screws and clips provided.

Table 6-4. AURORA Highway Crossing Signal LED Lamp Unit Gasket Replacement Procedure (Cont.)

Step	Procedure
6	Pivot the signal housing front cover closed. Check that the side lights are aligned with the openings in the case. 
7	Screw down the housing cover nut located towards the top of the cover.
8	Reapply power to the signal.
9	Perform the verification procedure provided in Table 3-3 and any alignment procedures required by the local authority or per AREMA Communication and Signals manual.

5 AURORA GATE ARM LIGHT CORRECTIVE MAINTENANCE PROCEDURES

5.1 GATE ARM LIGHT REPLACEMENT

The LEDs on the board have an operating life twenty times longer than the typical incandescent lamp in a signal head. The Gate Arm Light should be replaced following the procedure in Table 6-5 when any of the following occurs:

1) When more than three LEDs on one side of the light do not illuminate. If three LEDs go out, the gate arm can still be used and need not be replaced.

2) When a preventive or corrective maintenance procedure determines the lamp unit needs to be replaced.

3) When a troubleshooting procedure determines the lamp unit needs to be replaced.

4) When the board in the unit is 25 years old. Use the date of manufacture stamped on the board to determine age.

To replace the LED in the Gate Arm Light, follow the procedure in Table 6-5.

Table 6-5. AURORA Gate Arm Light Replacement Procedure

Step	Procedure
1	Remove malfunctioning Gate Arm Light and save mounting hardware. Tag the leads for re-assembly.
2	Check the condition of the bare wire and ensure it provides good electrical contact. Correct as necessary.
3	Perform the appropriate installation procedure, based on the kit and application: – See Table 3-4 for the AURORA Gate Arm Light Kit A30-0950 Installation Procedure – See Table 3-5 for the AURORA Gate Arm Light Kit A30-0944 Installation Procedure For a Gate Arm With Field Wires Passed Through the Light – See Table 3-6 for the AURORA Gate Arm Light Kit A30-0944 Installation Procedure For a Gate Arm With Field Wires Inside the Gate Arm
4	As stated in Tables 3-4, 3-5, and 3-6, the installation procedure must be followed by the AURORA Gate Arm Light Verification Test Procedure in Table 3-7.

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SECTION 7

PARTS CATALOG

1 GENERAL

The Parts Catalog describes and shows replacement parts for the AURORA Highway Crossing Signal and AURORA Gate Arm Light. Replacement parts listed are the lowest level replaceable unit (LLRU) that can be ordered. Each LLRU can be easily removed and replaced without using special tools or equipment.

2 ORDERING INFORMATION

Each part is assigned a 10-digit part number, which is also its drawing number. Use the ALSTOM 10-digit part number when ordering replacement parts.

3 PARTS LIST AND DRAWINGS

The figures and tables in this section identify each AURORA top level part number and the component parts.

Figure 7-1 is the AURORA LED Lamp Unit drawing and Figure 7-2 is the AURORA Signal Housing drawing.

Figure 7-3 is a drawing of the AURORA Gate Arm Light Kit without cords, while Figure 7-4 shows the AURORA Gate Arm EZ Plug-in Light Kit with cords.

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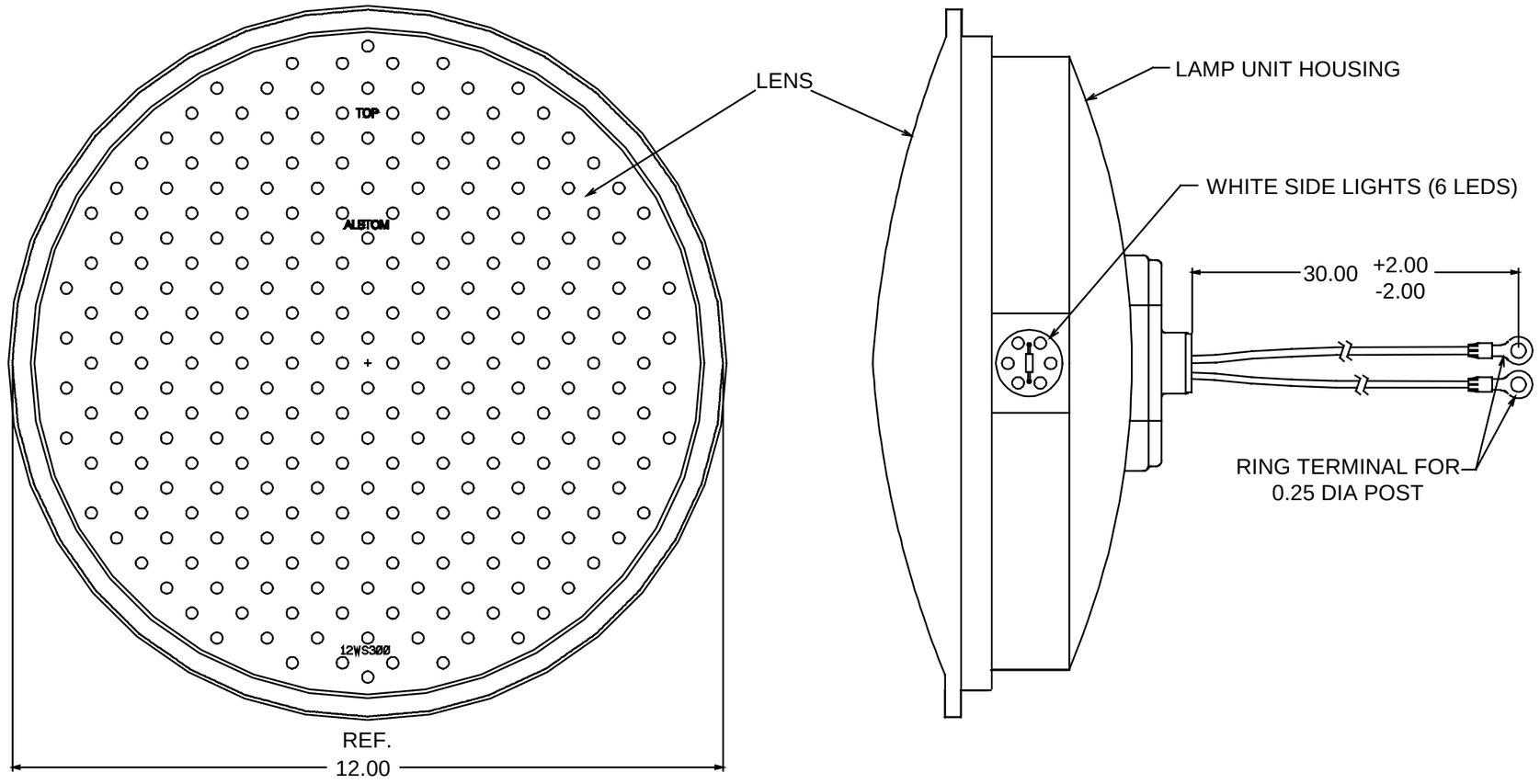
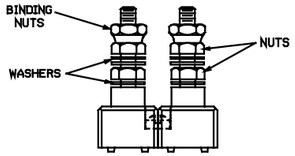


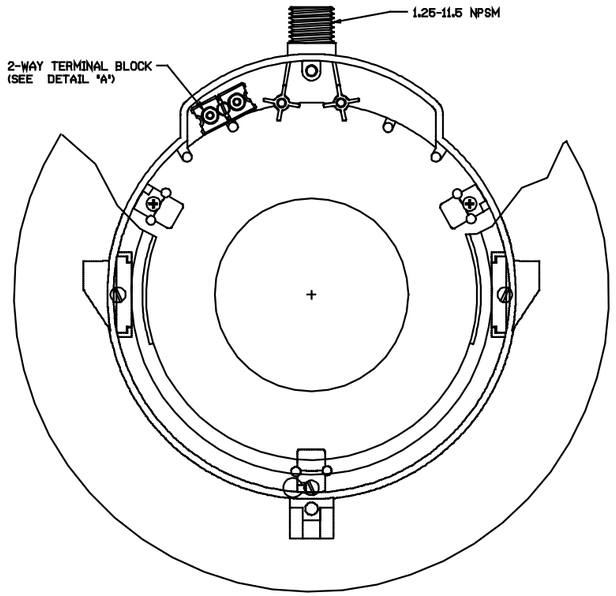
Figure 7-1. AURORA LED Lamp Unit Drawing, for P/N 52955-050-00 and 52955-051-00 (Shown)

QTY	DESCRIPTION
1	HOUSING, 12 INCH LED SIGNAL
1	HOOD, 15.88 INCH LONG
1	BACKGROUND, 20.00 INCH DIAMETER
4 EACH	MOUNTING SCREWS, CLIPS AND LOCKWASHERS FOR LED MODULE
4 EACH	MOUNTING SCREWS AND LOCKWASHERS FOR BACKGROUND
4 EACH	MOUNTING SCREWS, FLAT WASHERS AND LOCKWASHERS FOR HOOD

HOUSING SHALL INCLUDE AN AREMA TWO POST TERMINAL BLOCK.
COMPLETE WITH WASHERS, NUTS AND BINDING NUTS PER DETAIL.



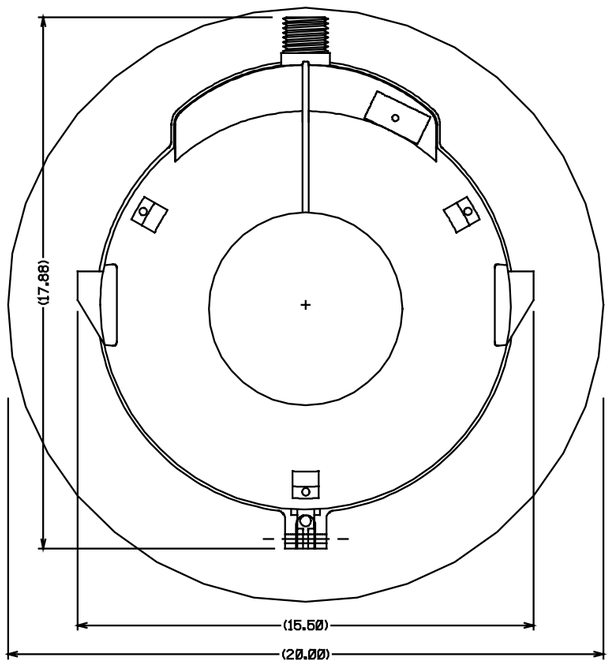
DETAIL "A"
VIEW OF 2 POST TERMINAL BLOCK
SHOWING WASHERS, NUTS & BINDING NUTS



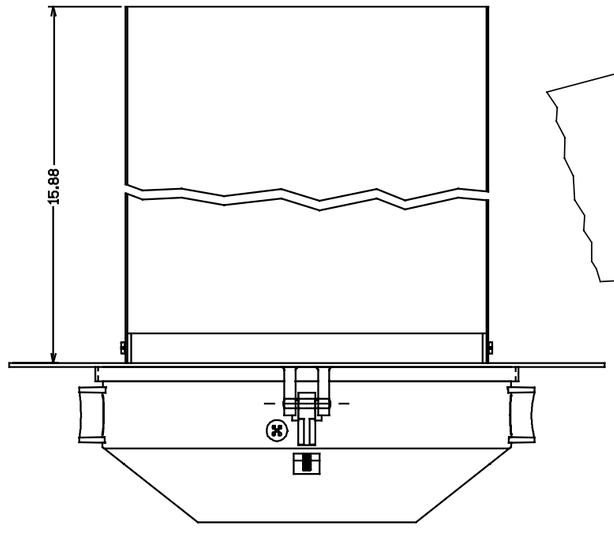
FRONT VIEW

ALSTOM

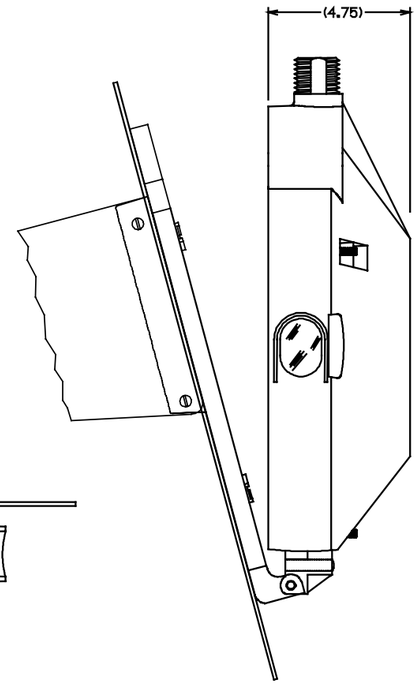
HOUSING 55051-013-00
HSSO AURDRA SIG XNG



BACK VIEW



BOTTOM VIEW



RIGHT SIDE VIEW

Figure 7-2. AURORA Signal Housing, P/N 55051-013-00

Table 7-1. AURORA 160 LED Lamp Unit Kit, No Housing for a 12 inch Highway Crossing Signal (59649-200-02)

Ref.	Description	Qty	Part Number
	Lamp Unit, AURORA+ 160	1	52955-050-00
	Carton, 12 Inch Led Lamp Unit	1	06200-204-00
	Gasket	1	13014-713-00

Table 7-2. AURORA 300 LED Lamp Unit Kit, No Housing for a 12 inch Highway Crossing Signal (59649-200-03)

Ref.	Description	Qty	Part Number
	Lamp Unit, AURORA+ 300	1	52955-051-00
	Carton, 12 Inch Led Lamp Unit	1	06200-204-00
	Gasket	1	13014-713-00

Table 7-3. AURORA 160 LED Lamp Unit Kit With Housing for a 12 inch Highway Crossing Signal Layout (59649-200-04)

Ref.	Description	Qty	Part Number
	Lamp Unit, AURORA+ 160	1	52955-050-00
	Housing, 12 Inch AURORA Signal	1	55051-013-00
	Gasket	1	13014-713-00

Table 7-4. AURORA 300 LED Lamp Unit Kit With Housing for a 12 inch Highway Crossing Signal Layout (59649-200-05)

Ref.	Description	Qty	Part Number
	Lamp Unit, AURORA+ 300	1	52955-051-00
	Housing, 12 Inch AURORA Signal	1	55051-013-00
	Gasket	1	13014-713-00

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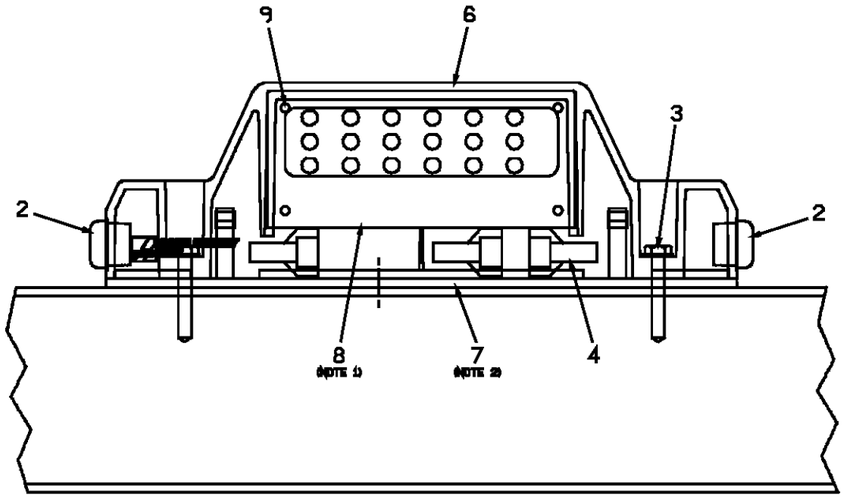

FIG.1
LIGHT CONFIGURED FOR THROUGH WIRE APPLICATIONS

NOTE 1- BOARD ASSEMBLIES (REF.9) TO BE SNAPPED TOGETHER USING SUPPORTS (REF.6). BOARDS ARE THEN TO BE PLACED IN HOUSING SLOT FOR SHIPMENT TO FIELD.
NOTE 2- PLATE (REF.7) IS ASSEMBLED IN THE FIELD.
NOTE 3- PLUGS (REF.1), BUSHINGS (REF.2) AND CONNECTORS (REF.4) ARE ASSEMBLED IN FIELD.

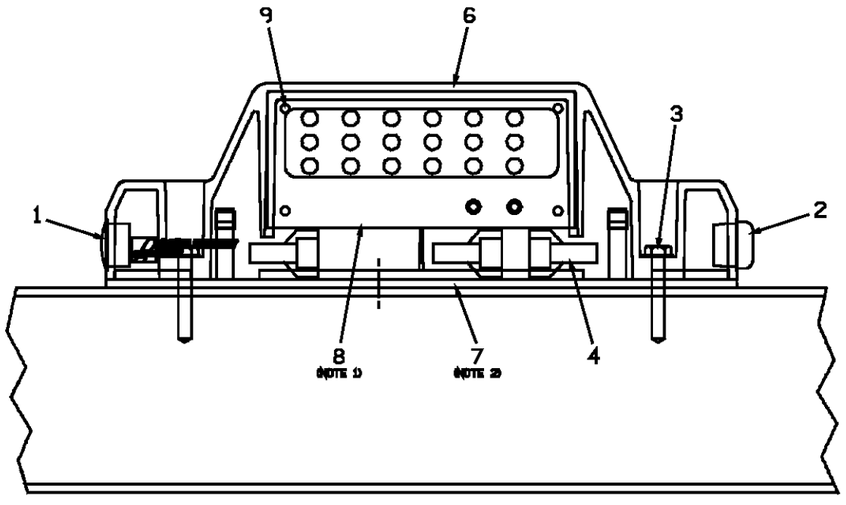

FIG.2
LIGHT CONFIGURED FOR TIP LIGHT OR WIRES RUN TO EACH LIGHT

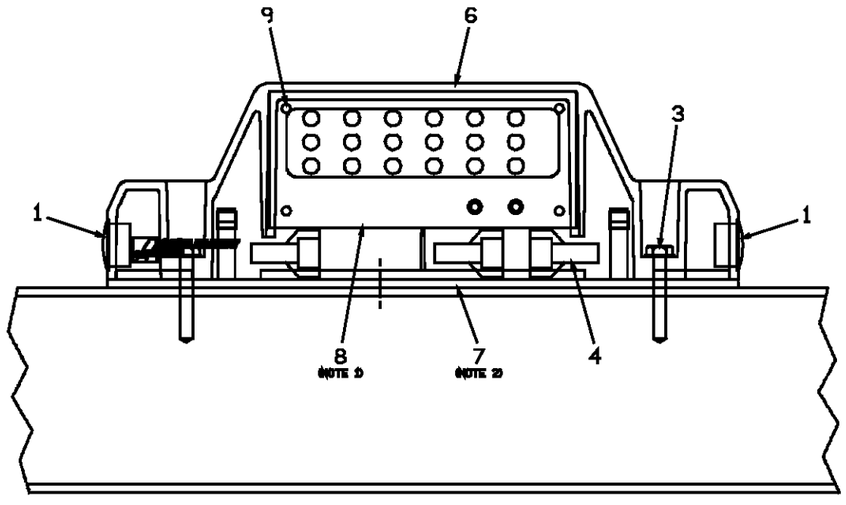

FIG.3
LIGHT CONFIGURED FOR GATE ARMS WITH FIELD WIRES INSIDE THE GATE ARM

Figure 7-3. AURORA Gate Arm Light Kit Complete, without Cords, Catalog Number A30-0944 (P/N 59649-201-01)

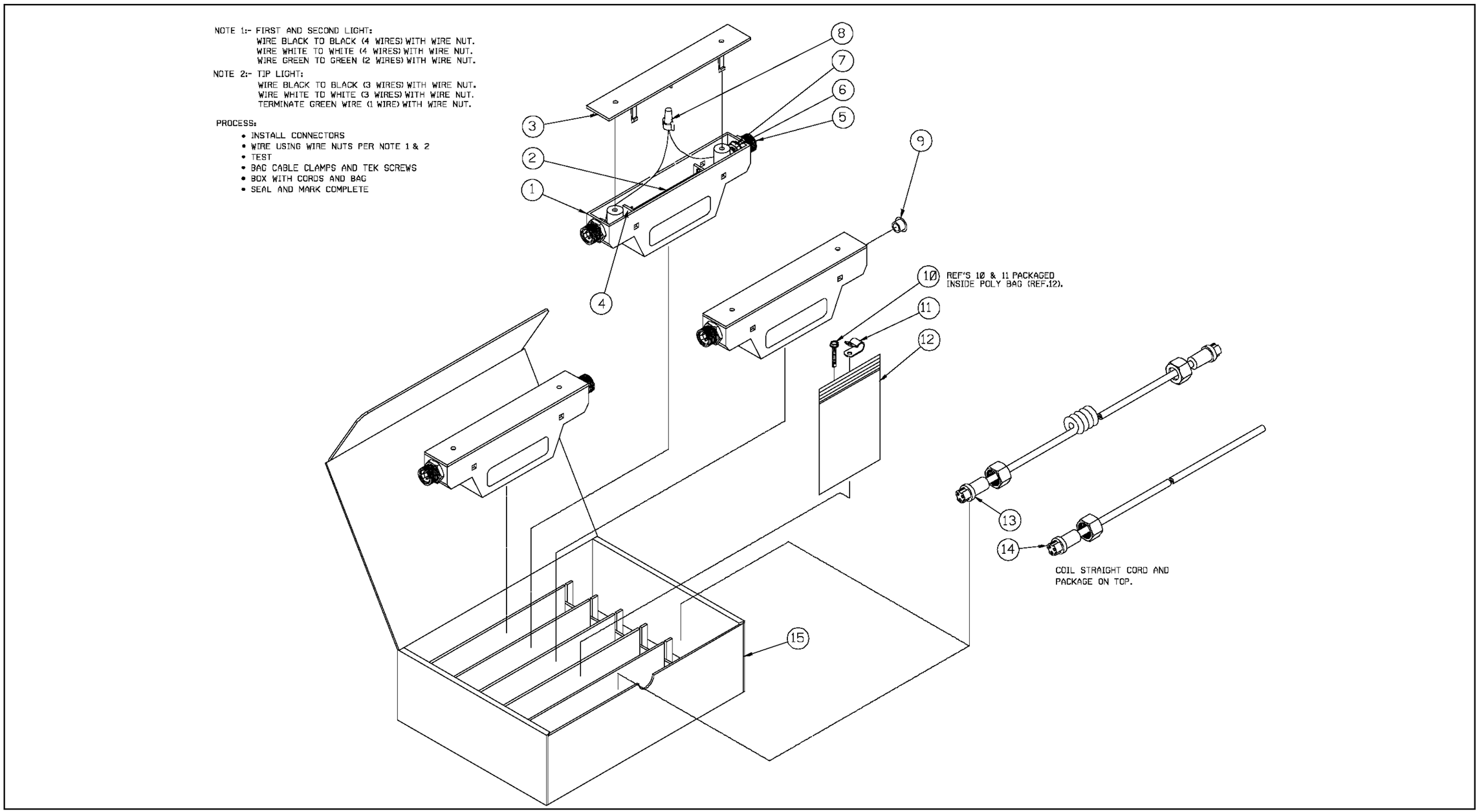
NOTE 1:- FIRST AND SECOND LIGHT:
WIRE BLACK TO BLACK (4 WIRES) WITH WIRE NUT.
WIRE WHITE TO WHITE (4 WIRES) WITH WIRE NUT.
WIRE GREEN TO GREEN (2 WIRES) WITH WIRE NUT.
NOTE 2:- TIP LIGHT:
WIRE BLACK TO BLACK (3 WIRES) WITH WIRE NUT.
WIRE WHITE TO WHITE (3 WIRES) WITH WIRE NUT.
TERMINATE GREEN WIRE (1 WIRE) WITH WIRE NUT.
PROCESS:
• INSTALL CONNECTORS
• WIRE USING WIRE NUTS PER NOTE 1 & 2
• TEST
• BAG CABLE CLAMPS AND TEK SCREWS
• BOX WITH CORDS AND BAG
• SEAL AND MARK COMPLETE
1
2
3
4
5
6
7
8
9
10
REF'S 10 & 11 PACKAGED INSIDE POLY BAG (REF.12).
11
12
13
14
COIL STRAIGHT CORD AND PACKAGE ON TOP.
15

Figure 7-4. AURORA Gate Arm Light EZ Plug-in Kit with Cords, Catalog Number A30-0950 (P/N 59649-201-03)

Table 7-5. AURORA Gate Arm Light Kit Complete, without Cords, Catalog Number A30-0944 (P/N 59649-201-01)

Ref.	Description	Qty	Part Number
	Light Complete	3	59960-000-01
	Miscellaneous Parts (includes the appropriate quantities of ref. Numbers 1 thru 4 for one (1) light in a recloseable poly bag)	3	29985-007-03
1	Plug, Snap-in	2 per light	20132-028-00
2	Bushing, Strain Relief	2 per light	56289-009-00
3	Screw, .190-16 X 1.25 Lg Self-Drilling Hex Wshr Hd	2 per light	04900-005-ON
4	Connector, Wire	3 per light	00958-021-ON
6	Housing	3	59950-000-00
7	Plate	3	36019-306-00
8	Board Assembly, LED	6	31166-156-01
9	Support, LED Board	12	41825-733-00
	Carton (with Dividers)	1	06200-201-00

Table 7-6. AURORA Gate Arm Light EZ Plug-in Kit with Cords, Catalog Number A30-0950 (P/N 59649-201-03)

Ref.	Description	Qty	Part Number
1	Housing	3	59950-000-00
2	Board Assembly, LED	6	31166-156-01
3	Plate, Bottom	3	36019-306-00
4	Support, LED Board	12	41825-733-00
ITEMS PROVIDED BY REBEL RAILWAY SUPPLY CO.			
5	Connector (With Pigtail)	5	100-1700
6	1/2 External Lock Washer	5	150-1313
7	1/2-20 UNF Jam Nut	5	150-2358
8	Wire Nut	9	120-0100
9	Snap-In Plug	1	100-1703
10	5/16 x 1-1/4 Lg. Washer Head TEK Screw	26	150-2700
11	3/8 Cable Clamp	20	120-0001
12	4 x 6 Recloseable Poly Bag	1	240-0200
13	Coiled Cord	2	100-1600
14	Straight Cord	1	100-1001
15	Carton (With Dividers)	1	240-0002

For Questions and Inquiries, Contact Customer Service at

1-800-717-4477

OR

www.alstomsignalingsolutions.com

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